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Outer Planet Studies

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Strategy

The research supported by this grant focuses on observational studies of the composition, structure, and variability of planetary, satellite, and cometary atmospheres. The techniques used include spectroscopy, spectrophotometry, and photometric imaging in the spectral region from 3000 Å to 5 μm. In addition to carrying out basic research into the origin, evolution, and current state of the solar system, these studies provide "ground-truth" support for observations of the solar system by NASA's missions, including the *Voyager* and *Galileo* spacecraft, the *Hubble Space Telescope*, and the proposed *CRAF-Cassini* mission.

Progress and Accomplishments

Major accomplishments during the past year include 1) publication in the *Astrophysical Journal* of a study of CH_3D in the spectrum of Neptune and a determination of its mixing ratio in its atmosphere; 2) publication in *Icarus* of a study of the aboriginal deuterium enrichment in protosolar ices and its relationship to the interstellar medium; 3) publication in *Science* of the detection and study of HDO in the spectrum of Venus and a determination of the implied D/H ratio in its atmosphere; 4) publication in the *Astrophysical Journal* of a study of the brightness, albedo, and temporal variability of Neptune; 5) completion and publication in the *Astrophysical Journal* of a study of NH_2 in Comet P/Giacobini-Zinner; 6) acceptance for publication of a study of the gas and dust production rates in P/Halley 1910; 7) continuation of our narrowband photopolarimetric imaging of Jupiter; 8) initiation of a study of the dust and gas components of Comet IRAS-Iraki-Alcock; and 9) continued observation of the spectra of Triton and Pluto in the region between 7500 Å and 3.3 μ.

Projected Accomplishments

Major efforts proposed for the coming year include 1) completion of the study of the dust and gas components of Comet IRAS-Iraki-Alcock, 2) search for minor non-equilibrium constituents in the atmospheres of Jupiter and Saturn, and 3) analysis of the spectra of Triton and Pluto to determine the amount of CH_4 in their atmospheres and on their surfaces.

Publications

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Lutz, B. L., Owen, T., and de Bergh, C. (1990). Deuterium Enrichment in the Primitive Ices of the Protosolar Nebula. *Icarus* **86,** 329P335.

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